UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex Parte Daniel Marcu

Application No. 09/854,327

Filing Date: May 11, 2001

Appeal Brief

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TABLE OF CONTENTS

Real Party in Interest
(37 C.F.R. § 41.37(c)(1)(i))

Appellant in the present appeal is Daniel Marcu, the named inventor of U.S. patent application no. 09/853,327 ('*327 Application*). The real party in interest is the University of Southern California, the assignee of record, and Language Weaver, Inc. of Marina del Rey, California, the exclusive licensee of the '*327 Application*.

Related Appeals and Interferences
(37 C.F.R. § 41.37(c)(1)(ii))

Appellants, the real party in interest, and their undersigned representative are unaware of any related appeals and interferences that are concluded, ongoing, or otherwise prospective as of the date of submission of this appeal brief (*Appeal Brief*).

Status of the Claims
(37 C.F.R. § 41.37(c)(1)(iii))

Independent claims 1, 15, and 27 are presently pending. Dependent claims 2-14, 16-26, and 28-33 are likewise pending and dependent, either directly or via an intermediate dependent claim, upon one of the aforementioned independent claims. All claims have been at least twice rejected. No claims have been allowed or are otherwise objected to by the Examiner. Appellants have elected to appeal all pending claims, 1-33, of the '*327 Application*.

Status of Amendments
(37 C.F.R. § 41.37(c)(1)(iv))

As filed on March 11, 2005, the '327 *Application* included 65 total claims; claims 34-65 were canceled during prosecution. Amendments to the claims were last submitted in a response to a non-final office action filed on October 15, 2007. A final action (*Final Action*) mailed on December 14, 2007 indicated the pendency of claims 1-33. Claims 1-33 remain pending and the rejection thereof is appealed herewith.

Summary of the Claimed Subject Matter
(37 C.F.R. § 41.37(c)(1)(v))

Independent Claim 1

Claim 1 as presented for appeal recites:

1. A machine translation decoding method comprising:

receiving as input a text segment in a source language to be translated into a target language;

generating an initial translation as an initial current target language translation;

estimating a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

applying one or more modification operators to the initial current target language translation to generate one or more modified target language translations;

estimating a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations;

setting a modified target language translation with a higher probability based on the comparison as the modified current target language translation; and

repeating said applying, said determining and said setting until occurrence of a termination condition.

See infra Claims Appendix, 27.

The '327 *Application* describes "receiving a text segment as input in a source language to be translated into a target language." Specification of the '327 *Application (Published Specification)*, Abstract[1]. For example, a text segment such as a sentence, clauses, paragraphs or entire treatises may be received. *Published Specification* [0073].

[1] All references to the *Published Specification* are exemplary and are not intended to be limiting. The present references are made solely to satisfy the requirements of 37 C.F.R. § 41.37(c)(1)(v). Reference is made to the published specification in order to allow the Examiner the benefit of searching the same via the HTML copy made available through the U.S. Patent and Trademark Office website.

An initial translation is generated as an initial current target language translation. *Published Specification*, Abstract. The initial translation may include a word for word translation, in one example. *Published Specification*, [0074].

A probability of correctness of the initial translation is estimated. The probability of correctness is based on alignment links between words and phrases in the source language and words and phrases in the target language. *Published Specification* [0075] and [0085].

One or more modification operators are applied to the initial current target language translation to generate one or more modified target language translations. *Published Specification* [0077] – [0087]. For example, one operation deletes the word of fertility 0 at position i in the current alignment. *Published Specification* [0082]. "[T]he present specification describes various modification operators that are also applied to the initial current target language translations in order to generate the one or more modified target language translations. *Published Specification*, [0092]. For example, "either all of the five sentence modification operations can be used or any subset thereof may be used to the exclusion of the others, depending on the preferences of the system designer and/or end-user." *Published Specification*, [0092]. In another example, "[i]n the second iteration, the decoder changes the first instance of the word "not" in the translation to "is" by applying the translateOneOrTwoWords operation, resulting in a new translation solution "that is is not fair", having the probabilities shown in FIG. 4, Iteration 2." *Published Specification*, [0095].

A probability of correctness of the one or more modified target language translations is estimated, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language. *Published Specification* [0075].

Whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation is determined by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified

target language translations. *Published Specification* [0089]. For example, the decoder determines whether any of the new translations are better than the current translation by comparing their respective probabilities of correctness. *Published Specification* [0089].

A modified target language translation with a higher probability is set based on the comparison as the modified current target language translation. *Published Specification* [0089].

The applying, the determining, and the setting are repeated until occurrence of a termination condition. *Published Specification* [0090].

FIGS. 2 and 4 of the '327 *Application* are illustrative and are reproduced here:

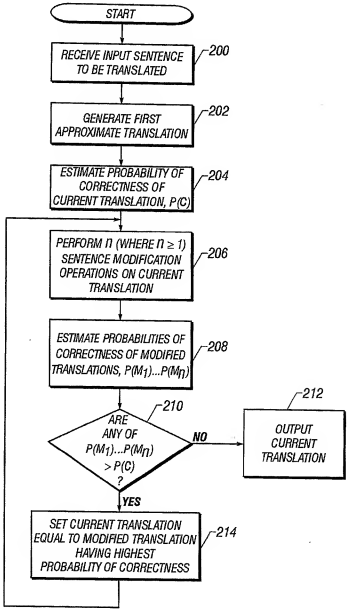
START
RECEIVE INPUT SENTENCE TO BE TRANSLATED
200
GENERATE FIRST APPROXIMATE TRANSLATION
202
ESTIMATE PROBABILITY OF CORRECTNESS OF CURRENT TRANSLATION, P(C)
204
PERFORM n (WHERE n ≥ 1) SENTENCE MODIFICATION OPERATIONS ON CURRENT TRANSLATION
206
ESTIMATE PROBABILITIES OF CORRECTNESS OF MODIFIED TRANSLATIONS, P(M1)...P(Mn)
208
ARE ANY OF P(M1)...P(Mn) > P(C) ?
210
NO
YES
OUTPUT CURRENT TRANSLATION
212
SET CURRENT TRANSLATION EQUAL TO MODIFIED TRANSLATION HAVING HIGHEST PROBABILITY OF CORRECTNESS
214

FIG. 2

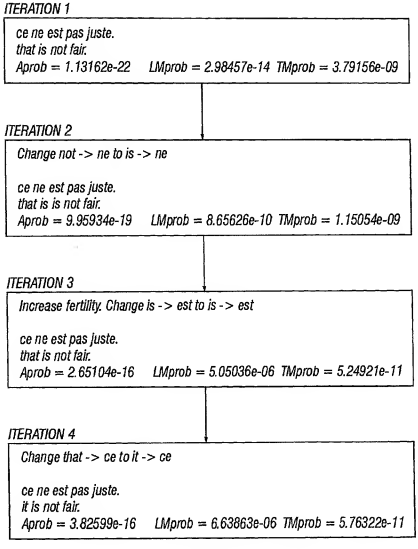
ITERATION 1
ce ne est pas juste.
that is not fair.
Aprob = 1.13162e-22 LMprob = 2.98457e-14 TMprob = 3.79156e-09
ITERATION 2
Change not -> ne to is -> ne
ce ne est pas juste.
that is is not fair.
Aprob = 9.95934e-19 LMprob = 8.65626e-10 TMprob = 1.15054e-09
ITERATION 3
Increase fertility. Change is -> est to is -> est
ce ne est pas juste.
that is not fair.
Aprob = 2.65104e-16 LMprob = 5.05036e-06 TMprob = 5.24921e-11
ITERATION 4
Change that -> ce to it -> ce
ce ne est pas juste.
it is not fair.
Aprob = 3.82599e-16 LMprob = 6.63863e-06 TMprob = 5.76322e-11

FIG. 4

Independent Claim 15

Claim 15 as presented for appeal recites:

15. A computer-implemented machine translation decoding method comprising:

receiving as input a text segment in a source language to be translated into a target language;

generating an initial translation as an initial current target language translation;

estimating a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

applying one or more modification operators to the initial current target language translation to generate one or more modified target language translations;

estimating a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations;

iteratively modifying a target language translation of a source language text based on the determination; and

repeating said applying, said determining and said setting until occurrence of a termination condition.

See infra Claims Appendix, 27.

Independent claim 15 also recites a translation decoding method that may be executed by "a computer-implemented machine." *Published Specification*, abstract. FIGS. 2 and 4 of the '327 *Application*, reproduced above, are illustrative in this regard.

The '327 *Application* describes "receiving a text segment as input in a source language to be translated into a target language." *Published Specification*, Abstract. For example, a text segment such as a sentence, clauses, paragraphs or entire treatises may be received. *Published Specification*, [0073].

An initial translation is generated as an initial current target language translation. *Published Specification*, Abstract. The initial translation may include a word for word translation, in one example. *Published Specification*, [0074].

A probability of correctness of the initial translation is estimated. The probability of correctness is based on alignment links between words and phrases in the source language and words and phrases in the target language. *Published Specification*, [0075] and [0085].

One or more modification operators are applied to the initial current target language translation to generate one or more modified target language translations. *Published Specification*, [0077] – [0087]. For example, one operation deletes the word of fertility 0 at position i in the current alignment. *Published Specification*, [0082]. "[T]he present specification describes various modification operators that are also applied to the initial current target language translations in order to generate the one or more modified target language translations. *Published Specification*, [0092]. For example, "either all of the five sentence modification operations can be used or any subset thereof may be used to the exclusion of the others, depending on the preferences of the system designer and/or end-user." *Published Specification*, [0092]. In another example, "[i]n the second iteration, the decoder changes the first instance of the word "not" in the translation to "is" by applying the translateOneOrTwoWords operation, resulting in a new translation solution "that is is not fair", having the probabilities shown in FIG. 4, Iteration 2." *Published Specification*, [0095].

A probability of correctness of the one or more modified target language translations is estimated, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language. *Published Specification*, [0075].

Whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation is determined by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified

target language translations. *Published Specification*, [0089]. For example, the decoder determines whether any of the new translations are better than the current translation by comparing their respective probabilities of correctness. *Published Specification*, [0089].

A target language translation of a source language text is iteratively modified based on the determination. *Published Specification*, [0094]-[0095].

The applying, the determining, and the setting are repeated until occurrence of a termination condition. *Published Specification*, [0090].

Independent Claim 27

Claim 27 as presented for appeal recites:

27. A machine translation decoder comprising:

a decoding engine, configured to receive as input a text segment in a source language to be translated into a target language and to generate an initial translation as an initial current target language translation, comprising one or more modification operators to be applied to a current target language translation to generate one or more modified target language translations;

a probability module in communication with the decoding engine configured to estimate a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language, to estimate a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language, and to determine whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations; and

a process loop configured to iteratively modify a target language translation of a source language text based on the determination and to repeat, the process loop terminating upon occurrence of a termination condition.

See infra Claims Appendix, 27. FIGS. 2 and 4 of the '327 *Application*, reproduced above, are illustrative with respect to claim 27.

The '327 *Application* describes a decoding engine configured to receive a text segment as input in a source language to be translated into a target language. *Published Specification*, [0073]. For example, a text segment such as a sentence, clauses, paragraphs or entire treatises may be received. *Published Specification* [0073].

The decoding engine also generates an initial translation as an initial current target language translation comprising one or more modification operators to be applied to a current target language translation to generate one or more modified target language translations. *Published Specification*, [0074]. The initial translation may include a word for word translation, in one example. *Published Specification*, [0074].

A probability module in communication with the decoding engine is configured to estimate a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language. *Published Specification*, [0088] – [0089]. The probability module is also configured to estimate a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language, and to determine whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations. *Published Specification*, [0088] – [0089].

A process loop is configured to iteratively modify a target language translation of a source language text based on the determination and to repeat, the process loop terminating upon occurrence of a termination condition. *Published Specification*, [0090].

The above paragraph citations are exemplary only and should not construed as limiting.

Grounds of Rejection to be Reviewed on Appeal
(37 C.F.R. § 41.37(c)(1)(vi))

I. Are claims 1-33 unpatentable over Poznanski, US 5,848,385, (*Poznanski*), in view of Berger, US 6,304,841 (*Berger*), which incorporates Brown et al., US 5,477,451 (*Brown*), under 35 U.S.C. § 103(a)?

Argument
(37 C.F.R. § 41.37(c)(1)(vii))

The following groups of claims are identified:

Group 1: Independent claims 1, 15, and 27, and dependent claims 2-4, 8, 18-24, and 28
Group 2: Dependent claims 5-7, 9, and 25
Group 3: Dependent claim 10, 26, and 33
Group 4: Dependent claim 11
Group 5: Dependent claims 12-14, 16-17, and 29-32

Group 1: Independent claims 1, 15, and 27, and dependent claims 2-4, 18, and 23

***Poznanski* fails to disclose "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation..."**

With respect to Group 1, *Poznanski* fails to disclose all limitations of independent claim 1, specifically, "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation." A *prima facie* case of obviousness requires that the prior art references teach or suggest all of the claim limitations. See *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). As discussed in previous responses, *Poznanski*, teaches "Each transformation **should** have the effect of improving the structure so that the structure converges on a correct language translation." Col. 4, lines 13-15 (emphasis added). *Poznanski*, therefore, merely **assume**s that the successive transformation results in a better translation. Because assuming that a transformation should have the effect of improving the structure is not equivalent to "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation" as recited in claim 1, *Poznanski* (in combination with *Berger*) can not teach or suggest all the claim limitations, as asserted by the Examiner. For at least this reason, *Poznanski* does not teach all the claim elements either singularly or in combination with *Berger*.

Poznanski teaches "apply[ing] rules of the source language grammar to the morphemes [of the text in the source language] so as to define the grammatical relationships between the morphemes." Col. 3, lines 41-43. *Poznanski* applies "bilingual equivalence rules which cause each source language sign to be replaced by an equivalent target language sign such that each source language morpheme is transformed to its equivalent target language morpheme and the grammatical data of each source language sign is transformed into corresponding grammatical data for the target language." Col. 3, lines 50-56. After generating the grammatical structures,

Poznanski teaches "evaluat[ing] the validity of the first attempt at the target language text by applying a set of target language grammar rules to the signs [morphemes and their associated data]." Col. 4, lines 3-5. *Poznanski* further states, "[i]f the evaluation is not successful, then the structure is transformed . . . so as effectively to alter the parsing tree without destroying any part of the structure which has been evaluated as being correct." Col.4, lines 9-12. The evaluation includes evaluating "whether the structure in the target language is correct. In order to do this, the evaluator applies a set of English grammar rules." Col. 6, lines 22-24. Thus, once a portion of the substructure described in *Poznanski* is deemed correct, no further adjustments are made to that portion. Therefore, *Poznanski* merely teaches a binary grammatical "correct/not correct" decision-making process as to the accuracy of a translation.

Appellant notes that the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." See *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Furthermore, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. See *In re Ratti*, 270 F.2d 810 (CCPA 1959).

The Examiner further supports this assertion stating that *Poznanski* "explicitly teaches not only should it, but if it doesn't improve, converge towards a correctly aligned, word ordered translation, the system will 'fail'." *Final Action*, 3. The Examiner goes on to assert that "[t]hus, the 'should' is a positive step, and not a mere assumption." *Final Action*, 3. The portion of *Poznanski* specifically cited by the Examiner for the Appellant is col. 4, lines 13-15, which again states that "[e]ach transformation should have the effect of improving the structure so that the structure converges on a correct target language translation." Appellant finds no other portions of *Poznanski* that recite positive steps that teach "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial

current target language translation," as set forth in claim 1. The Examiner also refers to, but fails to cite specifically, the lines just below column 4, lines 13-15, which states "[a]lternatively, if the system cannot produce a correct translation, it will fail after a relatively small number of iterations and pass on to another input sentence." Col. 4, lines 16-18. However, a system failure due to an inability to produce a "correct translation" simply is not the same as "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation," as set forth in claim 1. In fact, failing to produce a correct translation and skipping the sentence the system is attempting to translate is quite the opposite of "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation," as set forth in claim 1.

As such, *Poznanski's* disclosure of a system "fail[ure]" is not equivalent to, not an obvious variation of, nor is it even relevant to "determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation," as set forth in independent claim 1. As *Poznanski* fails to teach the aforementioned claim element, the present 35 U.S.C. § 103(a) rejection is overcome.

The Examiner also asserts that "Berger teaches a probability of correctness of an initial and modified target language translation, the probability (initial and modified) based on alignment links between words and phrases in the source language and words and phrases in the target language, and comparison thereof" at col. 2, lines 38-41, further stating that "there must be an initial translation probability, and a modified translation probability, and comparison thereof." *Final Action*, 7. Assertions by the Examiner that *Berger* must teach a "probability of correctness of an initial and modified target language translation, the probability (initial and modified) based on alignment links between words and phrases in the source language and words and phrases in the target language, and comparison thereof" based on a maximum entropy and gain discussion in *Berger* simply does not make it so. Instead, *Berger* discusses translation match scores for

the alignment estimated to be the most probable in the section cited by the Examiner. In the very lengthy "maximum entropy" sections of *Berger* referred to by the Examiner, Appellant interprets nothing that specifically teaches "estimating a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language"; estimating a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language"; "... comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations"; and "setting a modified target language translation with a higher probability based on the comparison as the modified current target language translation."

Berger analyzes potential translations of a source word into more than one alternate target words or phases. "Suppose we wish to model an expert translator's decisions on the proper French rendering of an English word." *Berger*, Col. 15, lines 7-9. The observation relied upon by *Berger* is that "the expert translator always chooses among . . . five French phrases." Col. 15, lines 20-21. *Berger* thus relies on the probabilities generated from training data to determine which of the five phrases is most likely to be an accurate translation in any given instance. To model which of the five phrases is most likely to be accurate, *Berger* discloses considering context. See, e.g., Col. 17, lines 20-57. The context described in *Berger* does not rely on a set of grammar rules but rather is based on neighboring words. See, e.g., Col. 7, line 44-Col. 8, line 49.

The Examiner also cites FIG. 6 and FIG. 7 of *Berger* as evidence of the correctness of probability results from alignment links. *Final Action*, 8. However, FIG. 6 is a self-described example of "unsafe segmentation." *Berger*, at least col. 4, line 7. FIG. 7, on the other hand, is an example of "safe segmentation." *Berger*, at least col. 4, line 8. Nothing within FIG. 6 or FIG. 7, nor the accompanying discussions in the specification of *Berger* appear to teach or suggest correctness probability results from alignment links between

words and phrases in the source language and phrases in the target language, as asserted by the Examiner. Instead, FIGS. 6 and 7 of *Berger* appear to discuss how to properly segment sentences.

The Examiner further admits that neither *Poznanski* nor *Berger* "explicitly teach setting a modified language translation with a higher probability based on the comparison as the modified target translation." The Examiner goes on to say, however, that "this step is necessary and inherent to Poznanski's improved structure." *Final Action, 8*. Appellant traverses. *Poznanski* may skip translating a sentence stating that "if the system cannot produce a correct translation, it will fail after a relatively small number of iterations and pass on to another input sentence." Col. 4, lines 16-18. Thus, setting a modified language translation with a higher probability is not a necessary step in *Poznanski*.

Furthermore, a *prima facie* case of obviousness requires that the prior art references teach or suggest all of the claim limitations. See *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). The Examiner's feeling that "this step is necessary and inherent to Poznanski's improved structure" is neither a teaching nor is it a suggestion of such a claim limitation.

Based at least on the remarks herein, Appellant believes that independent claims 1, 15, 27 are in condition for allowance. In view of the remarks set forth hereinabove, all claims depending from claims 1, 15, and 27 should also be in condition for allowance.

Group 2: Dependent claims 5-7, 9, and 25

> ***Poznanski* fails to disclose "applying one or more modification operators comprises changing in the initial current target language translation the translation of one or two words."**

Regarding dependent claim 5, the Examiner asserts that *Poznanski* teaches "applying one or more modification operators comprises changing in the initial current target language translation the translation of one or two words," based on "FIG. 7-like-

FIG. 15-likes." *Final Action*, 9. However, *Poznanski* describes reversing the subject and object and potentially changing a spelling of a word, not changing the translation of one or two words in the initial current target language.

> ***Poznanski* fails to disclose "wherein applying one or more modification operators comprises (i) changing in the initial current target language translation a translation of a word and concurrently (ii) inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a substantial probability of having a zero-value fertility."**

> ***Poznanski* fails to disclose "wherein applying one or more modification operators comprises deleting from the initial current target language translation a word having a zero-value fertility."**

With respect to claims 6 and 7, the Examiner refers Appellant to claim 5 of *Poznanski* and elsewhere to FIGS. 4 and 5 of *Berger* as evidence that the subject matter set forth in claims 6 and 7 is taught or suggested by *Poznanski* and apparently *Berger*. As discussed herein, however, *Poznanski* discusses the labeling of morphemes and target language structures with language signs, which may be transformed to settle on a well formed target language structure. *Poznanski*, at least the Abstract.

The Examiner also equates *Berger's* discussion of "superior" and "greater" in the FIGS. 4 and 5 discussion to claims 6 and 7. However, *Berger* discusses "superior" and "greater" as errors in translation. Specifically, *Berger* states in the discussion of FIG. 4 that the system chose "superior" when "greater" or "higher" is a preferable translation. In *Berger*, FIGS. 4 and 5 describe "typical errors encountered using an Estimation-Maximization (EM) based model in French-to-English translation resulting from the method of the present invention" and "improved translations of the sentences of FIG. 4,"

respectively. *Berger*, see at least col. 4, lines 1-7. The discussion in *Berger* of improving sentence translations, however, does not teach or suggest either "wherein applying one or more modification operators comprises (i) changing in the initial current target language translation a translation of a word and concurrently (ii) inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a substantial probability of having a zero-value fertility" or "wherein applying one or more modification operators comprises deleting from the initial current target language translation a word having a zero-value fertility."

> ***Poznanski* fails to disclose "wherein applying one or more modification operators comprises modifying an alignment between the source language text segment and the initial current target language translation by (i) eliminating a target language word from the initial current target language translation and (ii) linking words in the source language text segment."**

Similarly, with respect to claim 9, the Examiner bases the rejection on the same "figures 7-to like and Plaire a and FIG. 15." Claim 9 sets forth "wherein applying one or more modification operators comprises modifying an alignment between the source language text segment and the initial current target language translation by (i) eliminating a target language word from the initial current target language translation and (ii) linking words in the source language text segment." Neither FIG. 7 nor FIG. 15 of *Poznanski* teach or suggest claim 9. As discussed herein, FIGS. 7 and 15 of *Poznanski* appear, instead, to teach spelling changes and reversing subject and object.

Based at least on the remarks herein, Appellant believes that dependent claims 5-7, 9, and 25 are in condition for allowance.

Group 3: Dependent claims 10, 26, and 33

With respect to claim 10, 26, and 33 the Examiner rejects the claim based on "the same reasons and under the same rationale" as claims 5 and 6. *Final Action*, 15. Claim 10 recites and *Poznanski* fails to disclose "wherein applying one or more modification operators comprises applying two or more of the following: (i) changing in the initial current target language translation the translation of one or two words; (ii) changing in the initial current target language translation a translation of a word and concurrently inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a high probability of having a zero-value fertility; (iii) deleting from the initial current target language translation a word having a zero-value fertility; (iv) modifying an alignment between the source language text segment and the initial current target language translation by swapping non-overlapping target language word segments in the initial current target language translation; and (v) modifying an alignment between the source language text segment and the initial current target language translation by eliminating a target language word from the initial current target language translation and linking words in the source language text segment." While claims 5 and 6 do share some overlapping subject matter with claim 10, the claims are not the same. The Examiner refers Appellant to claim 5 of *Poznanski* and elsewhere to FIGS. 4 and 5 of *Berger* as evidence that the subject matter set forth in claim 10 is taught or suggested by *Poznanski* and apparently *Berger*. As discussed herein, however, *Poznanski* discusses the labeling of morphemes and target language structures with language signs, which may be transformed to settle on a well formed target language structure. See at least the Abstract, *Poznanski*.

The Examiner appears to equate *Berger's* discussion of "superior" and "greater" in the FIGS. 4 and 5 discussion to claim 6 and 7, and by extension, presumably claim 10. However, *Berger* discusses "superior" and "greater" as errors in translation. Specifically,

Berger states in the discussion of FIG. 4 that the system chose "superior" when "greater" or "higher" is a preferable translation. In *Berger*, FIGS. 4 and 5 describe "typical errors encountered using an Estimation-Maximization (EM) based model in French-to-English translation resulting from the method of the present invention" and "improved translations of the sentences of FIG. 4," respectively. *Berger*, see at least col. 4, lines 1-7. The discussion in *Berger* of improving sentence translations, however, does not teach or suggest "wherein applying one or more modification operators comprises applying two or more of the following: (i) changing in the initial current target language translation the translation of one or two words; (ii) changing in the initial current target language translation a translation of a word and concurrently inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a high probability of having a zero-value fertility; (iii) deleting from the initial current target language translation a word having a zero-value fertility; (iv) modifying an alignment between the source language text segment and the initial current target language translation by swapping non-overlapping target language word segments in the initial current target language translation; and (v) modifying an alignment between the source language text segment and the initial current target language translation by eliminating a target language word from the initial current target language translation and linking words in the source language text segment." Indeed, merely discussing that sentence translations may be improved does not identify the process by which improvements may be accomplished.

Based at least on the remarks herein, Appellant believes that dependent claims 10, 26, and 33 are in condition for allowance.

Group 4: Dependent claim 11

***Berger* fails to disclose "wherein estimating a probability of correctness of the one or more modified target language translations comprises calculating a probability of correctness for each of the one or more modified target language translations."**

With respect to claim 11, the Examiner asserts that *Poznanski* "does not explicitly teach estimating a probability of correctness of the one or more modified target language translations comprises calculating a probability of correctness for each of the one or more modified target language translations." *Final Action*, 12. The Examiner does not provide any citation within either *Poznanski* or *Berger* that the Examiner asserts *does* teach or suggest the subject matter set forth in claim 11. See *Final Action*, 12, 13. Indeed, *Berger* refers to total probabilities, but not "wherein estimating a probability of correctness of the one or more modified target language translations comprises calculating a probability of correctness for each of the one or more modified target language translations." *Berger*, col. 15, line 5 – col. 16, line 34. As discussed herein, *Poznanski* simply fails to discuss probabilities and more specifically does not teach or suggest "wherein estimating a probability of correctness of the one or more modified target language translations comprises calculating a probability of correctness for each of the one or more modified target language translations," as set forth in claim 11.

Based at least on the remarks herein, Appellant believes that dependent claim 11 is in condition for allowance.

Group 5: Dependent claims 12-14, 16-17, and 29-32

***Berger* fails to disclose "wherein the termination condition comprises a determination that a probability of correctness of a modified target language translation is no greater than a probability of correctness of the initial current target language translation."**

With respect to claim 12, the Examiner asserts that *Berger* teaches "wherein the termination condition comprises a determination that a probability of correctness of a modified target language translation is no greater than a probability of correctness of the initial current target language translation." The Examiner supports this assertion based on col. 15 line 7 - col. 16, line 31 of *Berger*, stating "his maximum entropy as determining a probability of correctness, the last iteration being the most/or maximum probability of being correct, by definition, see maximum entropy and gain discussion [col. 16 - col. 28] – language modeling-claim 30, C. 23. line 36, 40-48 – his termination condition, C. 28. line 45 – his termination condition" and the Examiner goes on to state that "the Examiner interprets, the modifying, gain and feature improvements to be terminated, once the maximum entropy is achieve, or the probability of correction, or correct alignment can not be further bettered." *Final Action*, 12, 13. *Berger* discusses probability distributions and selecting language models, but none of this discussion teaches or suggests "wherein the termination condition comprises a determination that a probability of correctness of a modified target language translation is no greater than a probability of correctness of the initial current target language translation," as set forth in claim 12. In fact, the Examiner's discussion of the interpretation of *Berger* does not equate *Berger's* teachings to determining that the modified target language translations are not an improvement, based on a probability of correctness, over the initial current target language translation. Just because *Berger* may discuss a stopping point for an algorithm does not mean that *Berger* teaches or suggests the subject matter specifically set forth in claim 12.

Neither *Berger* nor *Poznanski* disclose "wherein the termination condition comprises a completion of a predetermined number of iterations" OR "wherein the termination condition comprises a lapse of a predetermined amount of time."

With respect to claims 13 and 14, the Examiner asserts that because Appellant misunderstood the Official Notice the Examiner asserted in a previous office action that this prior art is now admitted. Appellant strongly disagrees. Appellant attempted to rebut the Official Notice to the best of Appellant's understanding of the Examiner's assertions and any misunderstanding of the assertions set forth by the Examiner are not to be interpreted as unresponsive or admitted prior art. *Final Action, 4, 13-14.* Neither *Poznanski* nor *Berger* teach the subject matter set forth in claims 13 and 14. Thus, regarding claims 13 and 14, the Examiner has simply dismissed the same under Official Notice. Appellant formally requests a specific showing of the subject matter in ALL of the claims in any future action. Note excerpt from MPEP below.

> "If the Appellant traverses such an [Official Notice] assertion the examiner should cite a reference in support of his or her position." See MPEP 2144.03.

Based at least on the remarks herein, Appellant believes that dependent claims 12-14, 16-17, and 29-32 are in condition for allowance.

Conclusion and Requested Relief

In light of the Examiner's failure to disclose each and every element of the presently claimed invention, a prima facie case of obviousness has not been established. As such, the Examiner's rejection is overcome. Appellant, therefore, respectfully request that the final rejection be overturned and the present application remanded with instructions to allow the same.

Respectfully Submitted,
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June 16, 2008

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Claims Appendix
(37 C.F.R. § 41.37(c)(1)(viii))

The claims involved in the present appeal are as follows:

1. A machine translation decoding method comprising:

receiving as input a text segment in a source language to be translated into a target language;

generating an initial translation as an initial current target language translation;

estimating a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

applying one or more modification operators to the initial current target language translation to generate one or more modified target language translations;

estimating a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations;

setting a modified target language translation with a higher probability based on the comparison as the modified current target language translation; and

repeating said applying, said determining and said setting until occurrence of a termination condition.

2. The method of claim 1 wherein the text segment comprises a clause, a sentence, a paragraph or a treatise.

3. The method of claim 1 wherein generating an initial translation comprises generating a gloss.

4. The method of claim 3 wherein the gloss is a word-for-word gloss or a phrase-for-phrase gloss.

5. The method of claim 1 wherein applying one or more modification operators comprises changing in the initial current target language translation the translation of one or two words.

6. The method of claim 1 wherein applying one or more modification operators comprises (i) changing in the initial current target language translation a translation of a word and concurrently (ii) inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a substantial probability of having a zero-value fertility.

7. The method of claim 1 wherein applying one or more modification operators comprises deleting from the initial current target language translation a word having a zero-value fertility.

8. The method of claim 1 wherein applying one or more modification operators comprises modifying an alignment between the source language text segment and the initial current target language translation by swapping non-overlapping target language word segments in the initial current target language translation.

9. The method of claim 1 wherein applying one or more modification operators comprises modifying an alignment between the source language text segment and the

initial current target language translation by (i) eliminating a target language word from the initial current target language translation and (ii) linking words in the source language text segment.

10. The method of claim 1 wherein applying one or more modification operators comprises applying two or more of the following: (i) changing in the initial current target language translation the translation of one or two words; (ii) changing in the initial current target language translation a translation of a word and concurrently inserting another word at a position that yields an alignment of highest probability between the source language text segment and the initial current target language translation, the inserted other word having a high probability of having a zero-value fertility; (iii) deleting from the initial current target language translation a word having a zero-value fertility; (iv) modifying an alignment between the source language text segment and the initial current target language translation by swapping non-overlapping target language word segments in the initial current target language translation; and (v) modifying an alignment between the source language text segment and the initial current target language translation by eliminating a target language word from the initial current target language translation and linking words in the source language text segment.

11. The method of claim 1 wherein estimating a probability of correctness of the one or more modified target language translations comprises calculating a probability of correctness for each of the one or more modified target language translations.

12. The method of claim 1 wherein the termination condition comprises a determination that a probability of correctness of a modified target language translation is no greater than a probability of correctness of the initial current target language translation.

13. The method of claim 1 wherein the termination condition comprises a completion of a predetermined number of iterations.

14. The method of claim 1 wherein the termination condition comprises a lapse of a predetermined amount of time.

15. A computer-implemented machine translation decoding method comprising:

receiving as input a text segment in a source language to be translated into a target language;

generating an initial translation as an initial current target language translation;

estimating a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

applying one or more modification operators to the initial current target language translation to generate one or more modified target language translations;

estimating a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language;

determining whether one or more of the modified target language translations represents an improved translation in comparison with the initial current target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations;

iteratively modifying a target language translation of a source language text based on the determination; and

repeating said applying, said determining and said setting until occurrence of a termination condition.

16. The method of claim 15 wherein the termination condition comprises a determination that a probability of correctness of a modified translation is no greater than a probability of correctness of a previous translation.

17. The method of claim 15 wherein the termination condition comprises a completion of a predetermined number of iterations.

18. The method of claim 15 wherein the source language text segment comprises a clause, a sentence, a paragraph, or a treatise.

19. The method of claim 15 wherein the method starts with an approximate target language translation and iteratively improves the translation with each successive iteration.

20. The method of claim 19 wherein the approximate target language translation comprises a gloss.

21. The method of claim 20 wherein the gloss comprises a word-for-word gloss or a phrase-for-phrase gloss.

22. The method of claim 19 wherein the approximate target language translation comprises a predetermined translation selected from among a plurality of predetermined translations.

23. The method of claim 15 wherein the method implements a greedy algorithm.

24. The method of claim 15 wherein iteratively modifying the translation comprises incrementally improving the translation with each iteration.

25. The method of claim 15 wherein iteratively modifying the translation comprises performing at each iteration one or more modification operations on the translation.

26. The method of claim 25 wherein the one or more modification operations comprises one or more of the following operations: (i) changing one or two words in the translation; (ii) changing a translation of a word and concurrently inserting another word at a position that yields an alignment of highest probability between the source language text segment and the translation, the inserted other word having a high probability of having a zero-value fertility; (iii) deleting from the translation a word having a zero-value fertility; (iv) modifying an alignment between the source language text segment and the translation by swapping non-overlapping target language word segments in the translation; and (v) modifying an alignment between the source language text segment and the translation by eliminating a target language word from the translation and linking words in the source language text segment.

27. A machine translation decoder comprising:

a decoding engine, configured to receive as input a text segment in a source language to be translated into a target language and to generate an initial translation as an initial current target language translation, comprising one or more modification operators to be applied to a current target language translation to generate one or more modified target language translations;

a probability module in communication with the decoding engine configured to estimate a probability of correctness of the initial translation, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language, to estimate a probability of correctness of the one or more modified target language translations, the probability based on alignment links between words and phrases in the source language and words and phrases in the target language, and to determine whether one or more of the modified target language translations represents an improved translation in comparison with the initial current

target language translation by comparing the estimated probability of correctness of the initial translation with the estimated probability of correctness of the one or more modified target language translations; and

a process loop configured to iteratively modify a target language translation of a source language text based on the determination and to repeat, the process loop terminating upon occurrence of a termination condition.

28. The decoder of claim 27 wherein the process loop controls the decoding engine to incrementally improve the current target language translation with each iteration.

29. The decoder of claim 27 further comprising a module for determining a probability of correctness for a translation.

30. The decoder of claim 29 wherein the probability module for determining a probability of correctness comprises a language model and a translation module.

31. The decoder of claim 29 wherein the process loop terminates upon a determination that a probability of correctness of a modified translation is no greater than a probability of correctness of a previous translation.

32. The method of claim 27 wherein the process loop terminates upon completion of a predetermined number of iterations.

33. The decoder of claim 27 wherein the one or more modification operators comprise one or more of the following: (i) an operator to change in the current target language translation the translation of one or two words; (ii) an operator to change in the current target language translation a translation of a word and to concurrently insert another word at a position that yields an alignment of highest probability between the source language text segment and the current target language translation, the inserted

other word having a high probability of having a zero-value fertility; (iii) an operator to delete from the current target language translation a word having a zero-value fertility; (iv) an operator to modify an alignment between the source language text segment and the current target language translation by swapping non-overlapping target language word segments in the current target language translation; and (v) an operator to modify an alignment between the source language text segment and the current target language translation by eliminating a target language word from the current target language translation and linking words in the source language text segment.

Evidence Appendix
37 C.F.R. § 41.37(c)(1)(ix)

No evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 has been presented or entered during prosecution of the present application. As such, no evidence under the aforementioned sections is presented or referenced herewith.

Related Proceedings Appendix
37 C.F.R. § 41.37(c)(1)(x)

No related proceedings, including concluded, ongoing, and otherwise prospective appeals or interferences, are known to Appellant, real party in interest, nor their agents and representatives. As such, no decisions or documentation related to such a proceedings is presented or referenced herewith.